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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/809,804	03/26/2004	Hiroshi Kanno	50024-030	7163

7590 10/05/2006  
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EXAMINER

YAMNITZKY, MARIE ROSE

ART UNIT PAPER NUMBER

1774

DATE MAILED: 10/05/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/809,804

Applicant(s)

KANNO ET AL.

Examiner

Marie R. Yamnitzky

Art Unit

1774

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 26 March 2004 and 14 December 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-24 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_.

1. Claims 1-24 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The use of the term “types” in claim 1 renders the claims indefinite. It is not clear what constitutes a “type” of luminescent material. It is not clear if the phrase “two or more types of different luminescent materials” has the same scope as the phrase “two or more different luminescent materials”.

The scope of a “heavy” metal as recited in claims 1 and 16 is not clear. While the specification gives examples of a heavy metal (page 20, lines 15-16), the heavy metal is not limited to those examples.

The structure of the phosphorescent material of formula (A1) as further defined by claims 5 and 6, and the structure of the phosphorescent material of formula (B1) as further defined by claim 17, is not clear. It is not clear if the “N” shown in formula (A2) in claim 6 is the nitrogen of the pyridine ring in (A1), such that R2 forms a ring that is fused to the pyridine ring, or if R2 is a substituted phenyl group with at least an amino group as a substituent. Similarly, it is not clear if the lines extending to the right and lower right in formulae (A3) and (B2) indicate bonding positions to the pyridine ring and metal of the parent structure, or if one or more of these lines indicate a substituent. (The examiner suggests that it would be clearer to provide the entire formula for the phosphorescent material in claims 5, 6 and 17, rather than just a portion of the formula.)

Claims 18-21 are confusing in reciting a “second” assisting dopant. These claims and the claims from which they directly or indirectly depend do not explicitly require a “first” assisting dopant. It is not clear if the terminology of “second” implicitly requires a “first”.

2. For purposes of comparing to the prior art, the examiner interprets claim 5 as requiring an A-quinoline ligand or substituted derivative thereof (R2 forming a fused ring structure with the pyridine ring in formula (A1)), and interprets claims 6 and 17 as requiring a phenylpyridine ligand or substituted derivative thereof.

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1-6, 12, 15-18 and 21-24 are rejected under 35 U.S.C. 102(b) as being anticipated by Mishima (US 2001/0053462 A1).

See the entire publication. In particular, see Examples 1-4 and the claims. The devices of these four examples meet the limitations of present claim 1.

Each of the devices of Examples 1-4 comprises tris(2-phenylpyridine) iridium complex, which provides a peak emission wavelength of 515 nm. This peak emission wavelength is within the scope of the peak wavelength range set forth in present claim 2 for the short

wavelength light emitting layer as well as the long wavelength light emitting layer. Each of these devices further comprises a different light emitting material that provides a peak emission wavelength within the range of 430 nm to 520 nm, and a different light emitting material that provides a peak emission wavelength within the range of 520 nm to 630 nm. See Table 1 on page 6 for the three peak emission wavelengths of the devices of Examples 1-4.

The device of Example 1 further meets the limitations of present claims 2-4 and 6 wherein the short wavelength light emitting layer and the long wavelength light emitting layer are the same layer.

The device of Example 2 further meets the limitations of present claims 2-6 and 15-17 wherein the short wavelength light emitting layer and the long wavelength light emitting layer are the same layer.

The device of Example 3 contains three separate light emitting layers, and further meets the limitations of present claims 2-4 and 6.

The device of Example 4 contains three separate light emitting layers, and further meets the limitations of present claims 2-6 and 15-17. This device also meets the limitations of present claims 18, 21, 23 and 24 wherein the second assisting dopant is not explicitly required to be different from the host material in the short wavelength light emitting layer. The carbazole derivative used as the host material in the phosphorescent layers has hole transport capability and is an amine-based material.

With respect to the ratio of maximum peak luminous intensity as recited in present claims 12 and 22, Mishima does not disclose the ratio for the three peak wavelengths emitted by the

exemplary devices. It is the examiner's position that it is reasonable to expect that Mishima's devices that meet the limitations of claim 3 also meet claim 12, and Mishima's devices that meet the limitations of claim 15 also meet claim 22, since Mishima's devices emit white light.

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 1-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mishima (US 2001/0053462 A1) as applied to claims 1-6, 12, 15-18 and 21-24 above, and for the further reasons set forth below.

Mishima does not explicitly disclose the iridium complex named in present claim 7, but teaches that 2-phenylquinoline derivatives may be used. For example, see paragraph [0015] and Examples 2 and 4. The 2-phenylquinoline derivative used in Examples 2 and 4 is an iridium complex having two 2-phenylquinoline ligands and an acetylacetonate ligand, whereas claim 7 requires an iridium complex having three 2-phenylquinoline ligands. It would have been *prima facie* obvious to one of ordinary skill in the art at the time of the invention to utilize iridium complexes of 2-phenylquinoline other than the complex used in Mishima's Examples 2 and 4. One of ordinary skill in the art at the time of the invention would have reasonably expected that a tris(2-phenylquinoline) iridium complex could be used for the same purpose as the bis complex

utilized in Examples 2 and 4 since Mishima's teachings in paragraph [0015] imply that any iridium complex of substituted or unsubstituted 2-phenylquinoline may be used.

Present claims 8, 13 and dependents require the device to have the layered structure of anode, long wavelength light emitting layer, short wavelength light emitting layer, cathode. Mishima's Examples 3 and 4, which have multiple light emitting layers, have the layers arranged in the order of shortest wavelength light emitting layer closest to anode, and longest wavelength light emitting layer closest to cathode (i.e. the reverse order required by claims 8, 13 and dependents). It would have been an obvious modification to one of ordinary skill in the art at the time of the invention to reverse the order of the light emitting layers without changing the function of the device.

Present claim 8 and dependents further require that the long wavelength layer contain a first assisting dopant having a hole transporting capability.

Present claim 13 and dependents further require that the short wavelength layer contain a second host material and an assisting dopant, and that the assisting dopant be composed of the same material as the first host material, which is the host material in the long wavelength layer.

Present claims 18, 23 and dependents require the device to have the layered structure of anode, short wavelength light emitting layer, long wavelength light emitting layer, cathode. These claims further require the short wavelength layer to contain an assisting dopant having hole transport capability. Claim 23 further requires the assisting dopant to be the same as the host material in the long wavelength light emitting layer.

Present claim 24 requires each of the long wavelength and short wavelength light emitting layers to contain a host material and a phosphorescent material, with the short wavelength light emitting layer also containing an assisting dopant that is composed of the same material as the host material in the long wavelength light emitting layer.

Claims 11 and 21 further require the assisting dopant to be an amine-based material, an anthracene derivative or an iridium complex.

The carbazole host materials utilized in the phosphorescent layer(s) of Mishima's devices have hole transport capability and are amine-based materials. However, presuming for the sake of argument that the first host material and the second host material of the present claims is not the same material, and that the assisting dopant for a particular layer is not the same as the host material of that layer, Mishima does not provide any examples having different host materials and meeting the claim limitations regarding the assisting dopant(s). Mishima teaches that the light emitting layers may comprise mixtures of host materials. Possible host materials as disclosed in paragraph [0036] include many materials known to have hole transport capability. It would have been within the level of ordinary skill of a worker in the art at the time of the invention to select a suitable combination of materials for use in the light emitting layers from materials known in the art and suggested by Mishima.

With respect to the volume ratio recited in present claims 9 and 19, it would have been within the level of ordinary skill of a worker in the art at the time of the invention to determine suitable and optimum relative amounts of different components in the light emitting layers in order to provide a functional device and to optimize device performance.



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With respect to the relative HOMO energy levels recited in present claims 10 and 20, it would have been *prima facie* obvious to one of ordinary skill in the art at the time of the invention to select combinations of materials having appropriate relative HOMO energy levels so as to affect the movement of holes to the phosphorescent material, the movement of holes to the phosphorescent material being a necessary requirement in order to achieve light emission from the phosphorescent material.

7. Miscellaneous:

In claims 4-7, 10, 16, 17 and 20, the period should be moved to the end of the claim.

Claim 23 recites that the long wavelength light emitting layer further contains a first host material and the short wavelength light emitting layer further contains a second host material. The examiner notes that the requirement for first host material is already recited in claim 3, from which claim 23 indirectly depends, and the requirement for a second host material is already recited in claim 15, from which claim 23 depends.

8. Any inquiry concerning this communication should be directed to Marie R. Yamnitzky at telephone number (571) 272-1531. The examiner works a flexible schedule but can generally be reached at this number from 6:30 a.m. to 4:00 p.m. Monday, Tuesday, Thursday and Friday, and every other Wednesday from 6:30 a.m. to 3:00 p.m.

The current fax number for all official faxes is (571) 273-8300. (Unofficial faxes to be sent directly to examiner Yamnitzky can be sent to (571) 273-1531.)

MRY  
October 01, 2006



MARIE YAMNITZKY  
PRIMARY EXAMINER

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